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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/661,600	09/15/2003	Yukio Taniguchi	242749US2	8508
22850	7590	06/28/2005	EXAMINER	
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			ROSASCO, STEPHEN D	
			ART UNIT	PAPER NUMBER

1756

DATE MAILED: 06/28/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/661,600

Applicant(s)

TANIGUCHI, YUKIO

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 10/17/03.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Detailed Action

The disclosure is objected to because of the following informalities: page 3, lines 5-6, the citation for the reference listed does not appear to be correct; claim 14, line 9, the word "deep" is used in a manner which is unclear, "deep from the first area toward the second area", and the specification is not informative in that the word is not used there.

Appropriate correction is required.

Claims 1-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claim language refers to a first and second axial line, but the description in the specification that uses this terminology is in a limited section (page 2, [0025]) and it is basically a repetition of the language in the claims. The description of the drawings and the drawings do not use this language at all. It is difficult to conclude that the interpretation of the claims in view of the specification is accurate if the language used for the description of the invention is different in both sections.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the cited art to Matsumura et al. ("Optimization of phase-modulated excimer-laser annealing method for growing highly-packed large-grains in Si thin-films) in view of (EP 1047119).

The claimed invention is directed to a crystallization apparatus, which includes a phase shift mask with a boundary area, which extends along a first axial line, and a first area and a second area, which are arranged on both sides of the boundary area have a predetermined phase difference therebetween. The boundary area has a phase distribution which varies from a phase of the first area to a phase of the second area.

And a crystallization method which illuminates a phase shift mask, and irradiates a polycrystal semiconductor film or an amorphous semiconductor film with a light ray having a light intensity distribution with an inverse peak pattern that a light intensity is minimum in an area corresponding to a phase shift portion of the phase shift mask, thereby generating a crystallized semiconductor film, comprising: arranging an image forming optical system in a light path between the polycrystal semiconductor film or the amorphous semiconductor film and the phase shift mask; setting an image side numerical aperture of the image forming optical system to a value required to generate the light intensity distribution with the inverse peak pattern; setting the polycrystal semiconductor film or the amorphous semiconductor film to a position which is optically conjugate with the phase shift mask through the image forming optical system; and using, as the phase shift mask, a phase shift mask which has a boundary area extending along a first axial line, and a first area and a second area which are arranged on both sides of the boundary area along a second axial line intersecting with the first axial line and have a predetermined phase

difference therebetween, the boundary area having a phase distribution which varies from a phase of the first area to a phase of the second area along the second axial line.

Matsumura et al. teach as shown in Fig. 7 a top view of the crystallized Si film together with the calculated intensity distribution for a linear shifter array with $p = 10 \text{ pm}$. Fig. 7a is the case of a nearly perfect plane wave without a diffusion plate. Corresponding to the "canyon-shaped" intensity distribution, a complicated morphology with grains as small as 2 pm in length was observed although it was periodic. In Fig. 7b large grains appeared, extending to left and right, as long as 3.5 um .

The teachings of Matsumura et al. differ from those of the applicant in that the applicant teaches a boundary area having a phase distribution which varies from a phase of the first area to a phase of the second area along the second axial line.

EP1047119 teaches (see claims) a process of crystallizing a semiconductor thin film (4) previously formed on a substrate (0) by irradiating the semiconductor thin film (4) with a laser beam (50), includes: a preparation step of dividing the surface of the substrate (0) into a plurality of division regions (D), and shaping a laser beam (50) to adjust an irradiation region (R) of the laser beam (50) such that one of the division regions (D) is collectively irradiated with one shot of the laser beam (50); a crystallization step of irradiating one of the division regions (D) with the laser beam (50) while optically modulating the intensity of the laser beam (50) such that a cyclic light and dark pattern is projected on the irradiation region (R).

The patent also teaches (claim 4) wherein said crystallization step is performed by using a phase shift mask (55a), which diffracts the laser beam (50) to form a cyclic light and dark pattern.

It would have been obvious to one having ordinary skill in the art to take the teachings of Matsumura et al. and combine them with the teachings off EP1047119 in order to make the claimed invention because it would be obvious to one that the phase distribution would vary between two adjoining areas by virtue of the use of 180 degree phase shifting in the two areas.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 18 is rejected under 35 U.S.C. 102(e) as being clearly anticipated by Pierrat (6,846,617) or Krikke et al. (6,583,855).

Pierrat teaches a method for using pupil filtering to mitigate optical proximity effects that arise during an optical lithography process for manufacturing an integrated circuit, comprising: applying a photoresist layer to a wafer; and exposing the photoresist layer through a mask; wherein exposing the photoresist layer involves performing pupil filtering, wherein a pupil filtering occurs in a single exposure using a single pupil filter that is symmetric with respect to the pupil center; wherein the pupil filtering corrects for optical proximity effects caused by an optical system used to expose the photoresist layer;

And wherein the pupil filtering introduces phase variations into the pupil of the optical system that is used to expose the photoresist layer;

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Krikke et al. teach a lithographic apparatus wherein an axial position of at least one of said partially transmissive radiation filter and said supplementary partially transmissive radiation filter is substantially coincident with a position selected from the group of axial positions comprising the position of the pupil of the illumination system, the position of the pupil of the projection system, and the axial position of planes conjugate with said pupils.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
06/11/05